Dance and Symmetry

Visual Thinking

Math Common Core connection and vertical alignment

Dance Grade 4Essential Standards:

4.CP.1.1 Organize dance phrases into simple dance sequences that have a beginning, middle, and end, and that vary the use of the dance elements.

4.CP.1.4. Understand how different strategies for problem solving in dance lead to different outcomes.

4.DM.1.2 Illustrate a variety of ways to use shapes

4.DM.1.5 Execute a variety of group special designs and relationships while dancing.

4.R.1.1 Use dance vocabulary to describe elements of movement (body, space, time, energy) while observing dance.

Math Common Core Standards:

Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

4.G.1Draw points, lines,line segments, rays,angles and perpendicular and parallel lines. Identify two dimensional figures, shapes

4.G.2 Classify two dimensional figures based on the presence or absence of parallel or perpendicular lines, specific size and types of angles

4.G.3recognize a line of symmetry

Understand congruence and similarities using physical models, transparencies, and geometry software.

8.G.1Verify experimentally the properties of rotation, reflection and translation

8.G.2 Understand that two dimensional figure is congruent to another

8.G.3 Describe the effect of translations, rotations and reflections on figures

8.G.4 Understand that two dimensional figure is similar to other figures

Essential Question:

How is creating a dance like solving a math problem?

Does symmetry contribute to harmony?

Vocabulary:

Math and Dance

Flip

symmetry( line, reflection , rotational, transitional)

Parallel

Perpendicular

Slide

Asymmetric

Symmetrical

Rotation(clockwise, counter clockwise )

Introduce symmetry

What is symmetry? Look at symmetry in the world.

Explain symmetry in your own words and give specific examples from your observations. (Repeat, balanced, simulacrum, the same, congruent...)

Look at other words that have the prefix Sym. Based on what you discovered from your observations what does Sym mean?

Sympathy- same feeling

Symposium- a collection of short essays by different authors on a similar topic

Symbol- a thing that represents or stands for something else.

Dancers like mathematics use 4 kinds of symmetry

Mirror-Refection

Rotational

Slide-Transitional

Glide

Dance and music often use symmetry but use a different vocabulary .... Cannon -translations in time, reversals-reflections, Retrograde, inversions

Look at Doris Humpher's dance from 1934"Air For The G String" describe what you see using dance and math vocabulary. Do you see symmetry? Explain and justify you response with specific examples. <http://www.youtube.com/watch?v=NjwJyaSIRqy>

Symmetry in dance shapes......line symmetry

Look at dance shapes

Can you recreate the shapes?

Is the shape symmetrical? If not could you make it symmetrical? Explain and demonstrate

How is your balance effected by symmetry?

Discuss the relationship to balance and symmetrical shapes with a partner. Share

Dancers work with a partner

Partner A creates a shape partner B describes it and identifies if it is symmetrical or asymmetrical.recreate the shape but change one element of the shape to make it symmetrical or asymmetrical.

Repeat with partner B creating the original shape

Dancers use symmetry and asymmetry not only in still shapes but in formations, transitions, movements and timing.

Quote:

"Symmetry is lifeless"Doris Humphery from The Art of Making Dance

Do you agree or disagree with this statement? Explain

Watch a variety of dance styles and forms with the purpose of identifying symmetry. Do you still feel the same way about the quote after watching the dance? Discuss this with partner.

(Folk dances, ballet, modern dance)

Pilobolus - "shadowland"

Paul Taylor and Alvin Ailey Revelations

George Balanchine- snow flakes Nutcracker Ballet

Dancers create 3 shapes at different levels - one high, one medium, one low

Move at a fast tempo don't think about the shape freeze it did you naturally create a symmetrical or asymmetrical shape. Now move slowly through space changing levels and freeze when I cue you. Discuss how you tempo effected your shape.

Now create three shapes at different levels 2 should be symmetrical and 1 asymmetrical. Put them in any order you want (high, medium, low)

How many different patterns of levels are possible?(create combinations)

H. M. L. H. M. L.

M. L. H. L. H. M

L. H. M. M. L. H

Select an order to do your shapes

How does sequence change when you add the attribute of symmetry or time to the element of space?

Now that you have an order for your shapes move slowly and smoothly transitioning from one shape to the next creating a short dance phrase. ( your transitions can be locomotor or non locomotor depending on the class )

Explore transitioning using fast movement.

Use some one fast transition and 2 slow transitions.

How does adding the element of time, levels and symmetry make your dance sequence more complex. Share your dance phrase with a partner and see if they can deconstruct your choreography to identify your pattern and the various attributes of time, space and shape.

Introduce mirroring or Reflection symmetry-moving with symmetry

Dancers sit facing each other. Select a leader and begin to mirror using slow smooth motions. Can you move symmetrically so that I can not tell who the leader or follower is?

Change leaders on the signal. Discuss this activity and notice that a mirror images looks the same but is actually the opposite . When I use my right arm it is your left. Use a mirror and words to understand this concept. Write a message backwards and forwards how does the mirror effect the writing?

Symmetrical drawing (pathways and motion )

Give dancers a large sheet if paper and 2colored pencils and have them try a draw "matching" symmetrical pathways. The 2sides should be mirror images.

How did this work? What made it difficult? Are your drawings symmetrical? How could you make this task more successful ?

Try it online <http://mathisfun.com/geometry/symmetry-artist.htmll>

Introduce stage directions and X Y coordinate grids

How can these things help you move more symmetrical?

Give dancers grid paper, label stage directions and have the create a symmetrical pathway map drawing at the same time. How does this help the image and the dancer? Could you identify the location of dancers and shapes using stage directions and coordinates? Discuss the relationship of a dancers spacing and coordinate grid in math.

Try this mirroring using locomotor movements , at different levels,change the tempo, quality of the movement , do it close to one another and across the room. How does changing the dance elements ? Create a mirroring dance with your partner use your math grid paper to help you.

Can you create a mirroring phrase in trios? Stand in a triangle one leader two followers on the signal turn a quarter turn clockwise now you have a new leader, change again and have the last person lead. How does this formation and number of dancers change your dance?

This leads use into Rotational Symmetry(turn)

Look at EOG test questions with rotational symmetry and line symmetry.

Select a new partner and face them, now try rotational symmetry. One person leads and the other person follows, but this time you do the EXACT same thing as your partner. For example if your partner lifts his right hand you lift your right hand. If they lean left you lean left. Instead of you being a mirror image you will find yourself leaning in opposite directions. Does this require more focus? Explain

Let each person lead and follow.

Many dancers find this more difficult than mirroring. Why do you think this is more difficult?

Look at rotational symmetry in art and nature (Escher, Islamic art, )

Hand out a copy of hexagon shape. Notice the body parts on the hexagon. What do you see? Fold along the lines in number order. Now get in groups of tree and place the hexagons on the floor rotate them together so that the pointed fingers touch in the center and the hexagons fit together. Now create this shape with your bodies. Do it again with the feet and arm shapes.

Can you make all three shapes at the same time? Find ways to transition from one shape to the next creating a dance sequence. Try varying the dance elements. What feels the best! Did you move symmetrically? Did you use rotations in you transitions? Can you move in symmetry but use asymmetrical movements? Explain. Set your choreography and memorize it to share. Share your dances and discuss.

(See attachment 1)

Math:

Your trio just created shaped that had rotational symmetry. One way of thinking of rotational symmetry is that each person is doing the same shape and facing toward the center of the circle. You have 3 fold rotational symmetry. That means you can turn the 3times thirds and the shapes will be the same. 2 fold symmetry 180 degree rotation half turn, 3fold 120 degree rotation thirds, 4fold rotation degree rotation fourths. All shapes have 360 degree rotation.

How can you use what you have experienced in dance to help you in math class?

As a group create a new shape that has rotational symmetry. Use the hexagon as a model, make three original shapes that have 3 fold rotation. Try using your whole body, each dancer creates 3 body shapes and teach them to your partners. Put them together to create an image that looks like Escher's art work. Try doing the shapes standing, lying down, sitting, or upside down. Be creative but make sure you are exactly alike and your whole group shape could be rotated and remain symmetrical, like petLs on a flower with everyone oriented to the center.

Put your shapes in a sequence. Practice your shapes until you have them memorized. Then put them in order and create transitional movement from one shape to the next. Practice until you have your dance memorized, no verbal cues. Add music and share.

Have more then one group perform at a time. How does this change the dance and how it looks .

Can you change the music? How does the music effect how you move?

Can you repeat the dance?

Change the energy quality-make it percussive, sustained, combine percussive and sustained.

Change the orientation. Try it backwards, upside down, change levels, your focus, travel.

Revise your dance based on your explorations edit Tito incorporate at least one idea from above.

What would happen if you added dancers? Would it work with 4, 5, 6 dancer ? How about the whole class? Explain.

Compare mirror/ reflection and rotational symmetry .

Can a shape have mirror symmetry and rotational symmetry at the same time? Explain.

Can you explain symmetry to a friend? Would it be helpful to use dance?

Think back to Doris Humphery's quote about symmetry is it lifeless?

Assessment question stems:

Did your precision improve with practice?

Did everyone contribute to the dance phrase?

Was everyone committed to your performance with focus and persistence ?

Where you all congruent moving in unison?

Where your transitions clear between shapes clear?

Can you use dance and math language to discuss your dance and compare it to others work?

You can continue to explore symmetry and dance by exploring translation/ slide symmetry

Glide symmetry and glide reflection

Symmetry/pattern/poetry/dance

Definition: symmetry is the deliberate use of balanced patterns in patterns of words, ideas or rhythms . Symmetry in poetry can include repetition .

Read the poems. How did the author use symmetry? Is repetition part of it?

How does it have a symmetrical pattern? How does it change the affect of the poem's meaning or feeling? Can you rewrite the poem without symmetry? Does it have the same effect?

How could you use the poems to create a dance?

I Heard a Bird Sing

By Oliver Herford

I heard a bird sing

In the dark of December.

A magical thing

And sweet to remember

" We are nearer to spring

Then we were in September,"

I heard a bird

In the dark of December.

The Little Boy and the Old Man

by Shel Silverstein

Said the little boy, "Sometimes I drop my spoon."

Said the old man, "I do that too."

The little boy whispered, "I wet my pants."

"I do that too," laughed the little old man.

Said the little boy, "I often cry."

The old man nodded, "So do I."

"But worst of all," said the boy, "it seems

Grown-ups don't pay attention to me."

And he felt the warmth of a wrinkled old hand.

"I know what you mean," said the little old man.

Resources:

Doris Humphery quote on symmetry:

Doris Humphrey says

Symmetry is lifeless.

Two-dimensional design is lifeless.

The eye is faster than the ear.

Movement looks slower and weaker on the stage.

All dances dances are too long.

A good ending is forty percent of the dance.

Monotony is fatal; look for contrasts.

Don't be a slave to, or a mutilator of, the music.

Listen to qualified advice; don't be arrogant.

Don't intellectualize; motivate movement.

Don't leave the ending to the end.

... from the Art of Making Dances.

The Art of Making Dance By Doris Humphery

Math Dance with Dr. Schaffer and Mr. Stern, by Karl Schaffer, Erik Stern, and Scott Kim

http://www.mathscareers.org.uk/viewItem.cfm?cit\_id=382814

<http://www.youtube.com/watch?v=NjwJyaSIRqY> - Doris Humphery' "Air for the G string"

<http://www.youtube.com/watch?v=SRFxsHUVtzM> - Korean B. Boy fantastic mirror dance

[www.youtube.com/watch?v=STK7AZ\_Zs\_E-Pilobolus](http://www.youtube.com/watch?v=STK7AZ_Zs_E-Pilobolus) "shadowland"

www.youtube.com/watch?v=DZjSxzlSSX0- Waltz of the Flowers from George Balanchine's The Nutcracker at the New York City Ballet ...

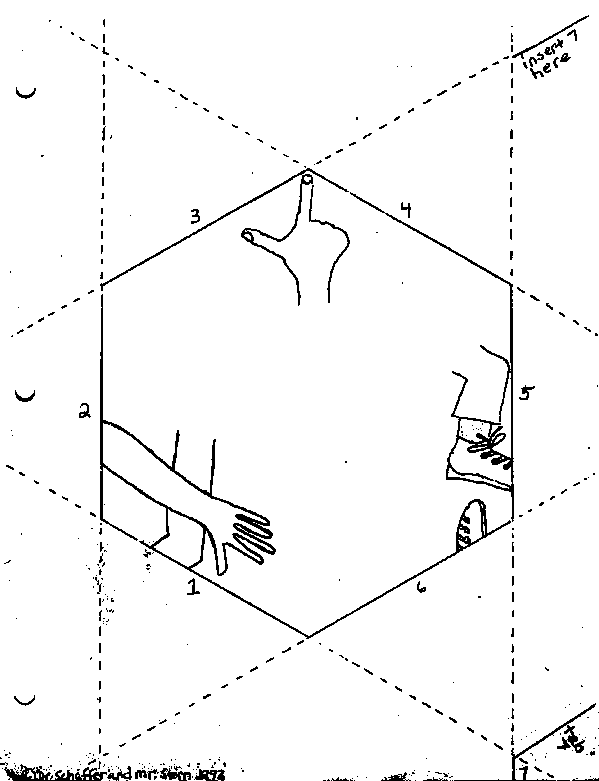
[www.mcescher.com/Gallery/gallery-symmetry.htm](http://www.mcescher.com/Gallery/gallery-symmetry.htm)- MC Escher

Beethoven's 5th

You can also google symmetry in nature, Islamic patterns, architecture

Lots of folk dances use symmetry as well

***Handout blackline master***

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